

REMARKS

Claims 1-12 and 17-23 are pending. Claims 1, 3, 4, 17, 18, and 19 are independent claims. Claims 13-16 were previously cancelled without prejudice. Claims 18 and 19 are amended. No new matter is added. Reconsideration and allowance of the above-referenced application are respectfully requested.

Claims 1, 3-12, and 17 stand rejected under 35 USC 103(a) as allegedly being unpatentable over Ishikawa (US 6066829), hereinafter "Ishikawa" in view of Kurosawa (US 6107600), hereinafter "Kurosawa". Claim 2 stands rejected under 35 USC 103(a) as allegedly being unpatentable over Ishikawa in view of Kurosawa, and further in view of Woelki et al. (US 5329090), hereinafter "Woelki". Claims 18 and 19 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Clement et al. (US 5653900), hereinafter "Clement". Claims 20-23 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Clement. These rejections are respectfully traversed.

Claim 1 recites, "reflecting an incident light beam by a starting angle of less than ninety degrees to form a first reflected light beam; varying the starting angle of reflection of the first reflected light beam by a pre-determined amount; reflecting the first reflected light beam to form a second reflected beam; varying an angle of reflection of the second reflected light beam; and directing the second reflected beam to form a spot on an object." Ishikawa describes a scanning-type laser marking apparatus which uses a laser beam spot to scan a surface of a work piece to thereby mark a desired pattern. See, e.g., Ishikawa, col. 1, lines 11-13. Kurosawa describes a laser machining apparatus and more particularly, a laser machining apparatus for a process of boring a printed circuit board or the like for rapidly machining holes by instantly positioning a laser beam at a particular point on the printed circuit board as a work and irradiating the pulse-formed laser beam emitted from a laser oscillator onto the point by being reflected on a deflecting mirror swung by a galvanometer scanner. See, e.g., Kurosawa, col. 1, lines 4-11.

The suggested combination of Ishikawa and Kurosawa does not disclose all the features recited in claim 1. The Office Action acknowledges that Ishikawa does not describe or suggest reflecting an incident light beam by a starting angle of less than ninety degrees to form a first

reflected light beam. In this regard, the Office Action states, "However, Ishikawa fails to explicitly teach the starting angle of the first and second reflected light beams being less than ninety degrees." See, Office Action, page 4, last paragraph.

Kurosawa does not rectify this deficiency in Ishikawa. As illustrated in Kurosawa, the incident angle α ranges from 0° to 45° . See, e.g., Kurosawa, Fig. 3A. The incident angle in Kurosawa is an angle between the incident light beam and an axis parallel to the surface of the mirror. See, e.g., Kurosawa, Fig. 3A. The starting angle, as described in the specification, is the angle between the incident beam and the reflected beam. See, e.g., Specification, [0078]. Therefore, the incident angle ranging from 0° to 45° , as described in Kurosawa, is equivalent to a starting angle ranging from 90° to 180° . Thus, any starting angle described by Kurosawa is necessarily 90° or greater. In contrast, claim 1 recites, "reflecting an incident light beam by a starting angle of less than ninety degrees to form a first reflected light beam." Therefore, the suggested combination of Ishikawa and Kurosawa does not describe all the features recited in claim 1.

Further, the Office Action contends that it would have been obvious to set the starting angles at less than ninety degrees. The Office Action relies on *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) to support this contention. The reliance on *In re Aller* is inappropriate. The MPEP states, "Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. '[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.' *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)." See, MPEP, Section 2144.05, II, A.

The claimed "a starting angle of less than ninety degrees" is critical to achieve the advantages of the printing system described in the specification. The specification describes that the optical arrangement allows using smaller mirrors. In this regard, the specification states, "The optics assembly may provide more working room on one or more mirrors in the optics assembly, i.e., more room or tolerance for alignment errors, for a given laser beam diameter size.

The optics assembly may use a smaller mirror.” See, Specification, [0003]. Further, the specification describes the advantages of using a smaller mirror. In this regard, the specification states, [0004]:

Smaller mirrors in the printing system may have several advantages. Smaller mirrors need less material and may be less expensive to manufacture. Smaller mirrors may be easier and faster to tilt in the optics assembly. Larger mirrors have greater inertia and require more torque to move than smaller mirrors. The printing system may use smaller, less complex components, such as actuators or micromotors, to move smaller mirrors. Smaller mirrors may fit in a smaller space of the printing system and allow the overall size of the printing system to be smaller.

Furthermore, the specification describes that the mirror 504 in Fig. 6 allows the maximum diameter D_{60} of the incident beam 600A to be larger than the maximum diameter D_{90} of the incident beam 500A in Fig. 5. See, e.g., Specification, [0082]. For example, if an incident light beam is incident on the surface of a mirror of diameter, D , at a starting angle of 90° , the effective diameter of the incident light beam is $D \times \cos(90^\circ) = 0.707D$. If the starting angle of the incident beam is decreased to 60° , then, by a similar calculation, the effective diameter of the incident light beam increases to $0.866D$. Thus, as described, the starting angle of less than ninety degrees maximizes the effective diameter of the incident light beam, which is particularly advantageous when using mirrors of small diameters. A beam of larger effective diameter improves the functionality of the printing system described. Therefore, the starting angle of less than ninety degrees is critical to improving the functionality of the printing system while minimizing the size of the system.

Ishikawa is not concerned with improving functionality while minimizing the size of the system. Rather, Ishikawa is concerned with identifying a spot on a work piece before marking the spot on the work piece. In this regard, Ishikawa states (Ishikawa, col. 2, lines52-59):

With this arrangement, prior to the marking, the pattern projected image forming means performs a visible guide beam scan on a workpiece surface so as to continuously and repeatedly draw a pattern to be marked. Due to the after-image effect on the human eye, a still projected image of the pattern is formed on the workpiece surface. Thus, an operator can adjust the workpiece position so that the projected image of the pattern is placed at a desired marking position.

Thus, Ishikawa proposes a solution by which an operator can adjust the position of a work piece so that a projected image of a pattern to be marked can be placed at a desired marking location. Subsequent to positioning, the work piece can be marked. No portion of Ishikawa describes minimizing the size of the printing system or using smaller mirrors to improve the functionality of the system.

Neither Ishikawa nor Kurosawa, taken alone or in combination, describe all the features recited in claim 1. Further, since the starting angle of less than ninety degrees is not a general condition of claim 1 and since employing the starting angle of less than ninety degrees offers specific advantages to realize the function of the system claimed, it is respectfully submitted that one skilled in the art would not have arrived at this range through routine experimentation. Therefore, reliance on *In re Aller* is inappropriate. Accordingly, claim 1 should be patentable. Claim 2 should also be patentable at least for the same reasons and the additional recitations that it contains.

Claim 3 recites, “reflecting an incident light beam to form a first reflected light beam; varying an angle of reflection of the first reflected light beam by a pre-determined amount; reflecting the first reflected light beam by a starting angle of less than ninety degrees to form a second reflected beam; varying the starting angle of reflection of the second reflected light beam; and directing the second reflected beam to form a spot on an object.” (Emphasis added.) Thus, claim 3 should be patentable at least for reasons similar to claim 1.

Claim 4 recites, “a first mirror; a first actuator attached to the first mirror; a second mirror; a second actuator attached to the second mirror; and a controller coupled to the first and second actuators, the controller controlling the first actuator to cause the first mirror to reflect an incident light beam by a starting angle of less than ninety degrees to form a first reflected light beam, the first actuator being operable to tilt the first mirror and vary the starting angle of reflection of the first reflected light beam by a pre-determined amount, the controller controlling the second actuator to cause the second mirror to reflect the first reflected light beam to form a second reflected beam, the second mirror directing the second reflected beam to form a spot on

an object, the second actuator being operable to tilt the second mirror and vary an angle of reflection of the second reflected light beam by a pre-determined amount.” (Emphasis added.)

The suggested combination of Ishikawa and Kurosawa does not disclose all the features of claim 4. As discussed previously, neither Ishikawa nor Kurosawa, taken alone or in combination, describe or suggest, a controller coupled to the first and second actuators, the controller controlling the first actuator to cause the first mirror to reflect an incident light beam by a starting angle of less than ninety degrees to form a first reflected light beam, the first actuator being operable to tilt the first mirror and vary the starting angle of reflection of the first reflected light beam by a pre-determined amount, the controller controlling the second actuator to cause the second mirror to reflect the first reflected light beam to form a second reflected beam, the second mirror directing the second reflected beam to form a spot on an object, the second actuator being operable to tilt the second mirror and vary an angle of reflection of the second reflected light beam by a pre-determined amount, as recited in claim 4, to improve functionality of the printing system and minimize the size of the system. Therefore, neither Ishikawa nor Kurosawa, taken alone or in combination, describe all the features recited in claim 4. Accordingly, claim 4 should be patentable. Claims 9-12 should also be patentable at least for the same reasons and the additional recitations that they contain.

For example, the Office Action contends that it would have been obvious to set the reflecting angle of the laser beam as claimed. The Office Action relies on *In re Boesch* 617 F. 2d 272, 205 USPQ 215 (CCPA 1980) to support this contention. The reliance on *In re Boesch* is inappropriate. The MPEP states, “A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.” See, MPEP, Section 2144.05, II, B. No evidence has been provided that the starting angle was previously recognized as a result-effective variable. Therefore, the reliance on *In re Boesch* is inappropriate. Claims 6, 7, 10, and 11 should be patentable at least for these additional reasons. Also, the reliance on *In re Japikse* 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) is inappropriate because the claimed rearranging of parts does in fact modify the operation

of the device. See, e.g., MPEP 2144.04(VI)(C) and US App. Pub. No. 2005-0088510 at Figs. 9A and 9B). Claims 8 and 9 should be patentable at least for these additional reasons.

Claim 17 recites, “a first mirror; a first actuator attached to the first mirror; a second mirror; a second actuator attached to the second mirror; and a controller coupled to the first and second actuators, the controller controlling the first actuator to cause the first mirror to reflect an incident light beam to form a first reflected light beam, the first actuator being operable to tilt the first mirror and vary an angle of reflection of the first reflected light beam by a pre-determined amount, the controller controlling the second actuator to cause the second mirror to reflect the first reflected light beam by a starting angle of less than ninety degrees to form a second reflected beam, the second mirror directing the second reflected beam to form a spot on an object, the second actuator being operable to tilt the second mirror and vary an angle of reflection of the second reflected light beam by a pre-determined amount.” (Emphasis added.) Thus, claim 17 should be patentable at least for reasons similar to claim 4.

As amended, in dependent claim 18 recites, “a first mirror to reflect an incident light beam by a starting angle of less than ninety degrees to form a first reflected light beam; a first actuator attached to the first mirror, the first actuator being operable to tilt the first mirror and vary an angle of reflection of the first reflected light beam, wherein the first actuator and the first mirror control scanning by a second reflected beam in a direction perpendicular relative to a direction of movement of an object, the movement occurring during the scanning of the object by the second reflected beam; a second mirror to reflect the first reflected light beam to form the second reflected beam, the second mirror directing the second reflected beam toward the object; and a second actuator attached to the second mirror, the second actuator being operable to tilt the second mirror and vary an angle of reflection of the second reflected light beam, wherein the second actuator and the second mirror control scanning by the second reflected beam in a direction parallel relative to direction of movement of the object.” (Emphasis added).

Clement does not disclose all the features recited in claim 18. In this regard, Clement describes a method and an apparatus for marking a moving body of material using a high energy density beam. See, e.g., Clement, col. 1, lines 3-5. No portion of Clement describes or suggests

“a first mirror to reflect an incident light beam by a starting angle of less than ninety degrees.”
Therefore, Clement does not describe or suggest all the features of claim 18. Accordingly, claim 18 should be patentable. Claims 22 and 23 should also be patentable at least for the same reasons and the additional recitations that they contain.

As amended, claim 19 recites, “reflecting an incident light beam by a starting angle of less than ninety degrees to form a first reflected light beam; varying an angle of reflection of the first reflected light beam to control scanning by a second reflected beam in a direction perpendicular relative to a direction of movement of an object, the movement occurring during the scanning of the object by the second reflected beam; reflecting the first reflected light beam to form the second reflected beam toward the object; varying an angle of reflection of the second reflected light beam to control scanning by the second reflected beam in a direction parallel relative to direction of movement of the object.” (Emphasis added.) Claim 19 relates to a method corresponding to claim 18 and should be patentable at least for similar reasons. Claims 20 and 21 should also be patentable at least for the same reasons and the additional recitations that they contain.

CONCLUSION

In view of the remarks herein, claims 1-12 and 17-23 should be in condition for allowance and notice of allowance is respectfully requested. The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence with other positions of the Examiner that have not been explicitly contested. Accordingly, the arguments for patentability of a claim should not be construed as implying that there are not other valid reasons for patentability of that claim or other claims.

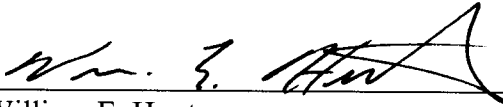
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Page : 14 of 14

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